Visualizing local doping effects of individual water clusters on gold(111)-supported graphene

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Supporting Information

Methods

Au(111)/mica substrates (1.4 cm × 1.1 cm; gold thickness: 150 nm) were purchased from SPI. A sealed container containing the Au(111)/mica substrate was opened in a N_2/water vapor purged glovebag with controlled RH of 40%. The substrate was allowed to equilibrate with the environment for ~5 min, and then graphene sheets were deposited onto the Au(111) surface by mechanical exfoliation of Kish graphite.

Thin graphene flakes were first searched for under an optical microscope. Few-layer (<3) graphene was hard to identify on the Au surface, but often appeared around the edges of thicker graphite flakes that can be more readily observed on the surface (Figure S1). To locate and confirm the few-layer graphene areas, AFM was subsequently performed under tapping mode on a Digital Instrument Nanoscope IIIA.

STM studies were carried out using an Omicron LT-STM operating under ultrahigh vacuum ($<10^{-10}$ torr) at both room temperature and 77 K. Figure S1(a) shows the sample configuration for the STM measurement. A mechanically cut Pt-Ir tip was used and calibrated against the Au(111) surface. The bias voltage was applied to the sample with respect to the tip. STS spectroscopy measurements were performed under open feedback conditions.

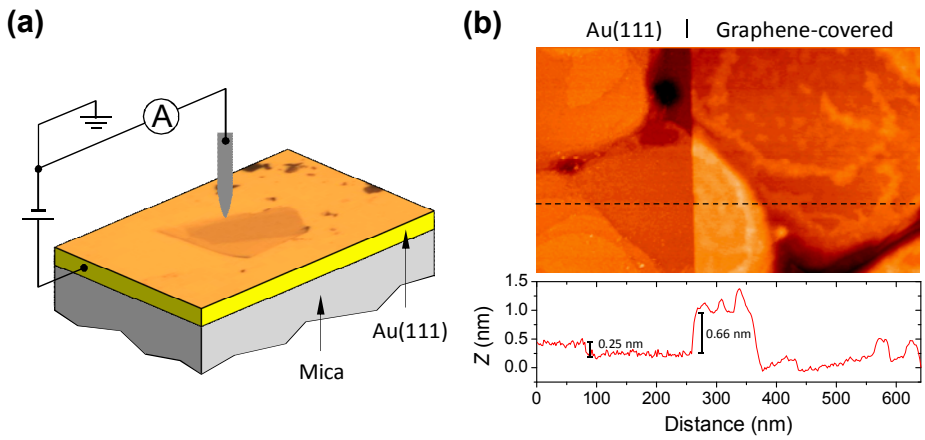

Figure S1. (a) The sample configuration for STM measurement. (b) A typical constant-current image of the Au(111) surface, with the right part of the image area covered by graphene. The height profile along the black dashed line is given at the bottom of the image. The height values of a Au step and the graphene are indicated on the plot. The measured height value of ~0.25 nm for the Au step is in agreement with a single Au(111) step (0.24 nm). The height of the graphene layer with respect to the Au(111) surface (0.66 nm) is consistent with the double-step height on a graphite surface (0.67 nm). This allows us to identify the graphene sample to be a bilayer.